CLAIMS

We claim:

1. A heavy-duty vehicle adapted for use in an industrial environment, comprising:

a heavy-duty vehicle frame;

a plurality of wheels mounted with the vehicle frame, each of the wheels adapted for engagement with a surface such as land;

an engine mounted with the vehicle frame;

an electrical generator operatively engaged with and driven by the engine;

a first switched reluctance (SR) motor operably engaging a first wheel of the plurality of wheels, the first SR motor powered by the electrical generator; and

a digital control system coupled to the SR motor is adapted to control the SR motor individually and to drive the vehicle.

2. The heavy-duty vehicle of claim 1, wherein the electrical generator is an alternating current (AC) generator.

3. The heavy-duty vehicle of claim 1, wherein the engine is a diesel engine.

4. The heavy-duty vehicle of claim 1, wherein the engine is adapted to run at a substantially constant RPM.

5. The heavy-duty vehicle of claim 1, further comprising:

a heavy-duty materials handling system, mounted with the vehicle frame;

6. The heavy-duty vehicle of claim 5, wherein the digital control system is further adapted to control the materials handling system.

7. The heavy-duty vehicle of claim 1, further comprising:

an operator control system, adapted to provide a vehicle operator with operational control over the heavy-duty vehicle.

8. The heavy-duty vehicle of claim 1, the digital control system comprising:

a master unit, adapted to receive commands from the operator control system;

a drive remote unit, coupled to the first SR motor;

a network, coupled to the master unit and the remote unit, adapted for message transmission between the master unit and the remote unit.

9. The heavy-duty vehicle of claim 8, further comprising:

an AC to direct current (DC) power converter, coupled between the electrical generator and the first SR motor,

wherein the drive remote unit is further coupled to the AC to DC power converter and to the network, and

wherein the master unit is further adapted to control operating parameters of the AC to DC power converter via the drive remote unit.

10. The heavy-duty vehicle of claim 1, wherein the first SR motor is further adapted to control a second wheel of the plurality of wheels.

11. The heavy-duty vehicle of claim 1, further comprising:

a second SR motor, operably engaging a second wheel of the plurality of wheels, the second SR motor powered by the electrical generator,

wherein the digital control system is coupled to the first SR motor and the second SR motor for controlling operation of the first SR motor and the second SR motor individually, and for controlling operation of the first SR motor and the second SR motor together for driving the vehicle and for controlling the materials handling system.

12. The heavy-duty vehicle of claim 1, further comprising:

a chopping system, adapted to dissipate excess DC voltage.

13. The heavy-duty vehicle of claim 1, further comprising:

a power storage system, adapted to store excess DC voltage.

14. The heavy-duty vehicle of claim 1, further comprising:

a power feedback system, adapted to drive the engine from excess electrical power fed back to the electrical generator.

15. The heavy-duty vehicle of claim 1, the first SR motor further adapted to provide braking for the first wheel.

16. The heavy-duty vehicle of claim 1, the heavy-duty materials handling system comprising:

a third SR motor, electrically coupled to the electrical generator; and
a heavy-duty lifting apparatus, driven by the third SR motor.

17. The heavy-duty vehicle of claim 1, wherein the heavy-duty lifting apparatus is an apparatus for lifting a container.

18. A method for providing traction for a multi-wheeled heavy-duty materials handling apparatus, comprising the steps of:

running an engine;
driving a generator from the engine, producing a DC voltage;
switching the DC voltage, driving a first switched reluctance (SR) motor;
driving a first wheel of the heavy-duty materials handling apparatus by the SR motor;
controlling the operation of the first SR motor by a digital control system; and
controlling the operation of the vehicle and a materials handling system of the vehicle by the digital control system.

19. The method of claim 18, the step of driving a generator comprising the steps of:

driving an AC generator from the engine; and
converting an output of the AC generator to the DC voltage.

20. The method of claim 18, the step of running an engine comprising the step of:
running the engine at a substantially constant RPM.

21. The method of claim 18, further comprising the step of:
dissipating excess power when slowing the SR motor from a predetermined speed.

22. The method of claim 18, wherein the SR motor is a multi-phase motor having a plurality of poles, further comprising the steps of:

energizing less than all of the poles of the SR motor;

holding the motor in a predetermined rotational position.

23. The method of claim 18, further comprising the step of:

reversing the first wheel, comprising the step of:

reversing the SR motor.

24. The method of claim 18, the step of switching the DC voltage further comprises the step of:

driving a second SR motor;

further comprising the steps of:

driving a second wheel of the heavy-duty materials handling apparatus by the SR motor;

controlling the operation of the second SR motor by the digital control system.

25. The method of claim 18, further comprising the steps of:

driving a second wheel of the heavy-duty materials handling apparatus by the first SR motor.

26. A heavy-duty hoisting apparatus adapted for use in an industrial environment, comprising:

a heavy-duty frame;

a hoisting mechanism mounted with the vehicle frame;

a switched reluctance (SR) motor operably engaging the hoisting mechanism for lifting and lowering a load, and

a digital control system coupled to the SR motor is adapted to control the SR motor individually and to control the hoisting mechanism.

27. The heavy-duty hoisting apparatus of claim 26, further comprising:

an engine mounted with the vehicle frame; and

an electrical generator operatively engaged with and driven by the engine;

wherein the SR motor is powered by the electrical generator.

28. The heavy-duty hoisting apparatus of claim 26, wherein the electrical generator is an alternating current (AC) generator.

29. The heavy-duty hoisting apparatus of claim 26, wherein the SR motor is powered from power source external to the heavy-duty hoisting apparatus.